

REMARKS

Claims 44-47 and 50-54 are pending in this continuation application. Claims 1-43, 48, and 49 were prosecuted, and allowed, in U.S. Application No. 09/891,699 (now U.S. Patent No. 6,734,971), the parent application to the present continuation application. The present continuation application is directed to taking up further prosecution of Claims 44-47 and 50, which were canceled in the parent application.

By this paper Claims 44 and 50 have both been amended, and Claims 51-54 have been added, to more particularly point out and distinctly claim the subject matter that applicant regards as the invention. The amendments to Claims 44 and 50, and the new Claims 51-54, contain no new matter and are fully supported in the specification, see for example, page 15 line 16 through page 16 line 19, and page 37 line 24 through page 39 line 15, of the present application.

Objection to the Drawings

In paragraph 1 of the pending Office Action, the Examiner stated that corrected drawings in compliance with 37 CFR § 1.121(d) are required because the drawings in the application include hand-written figures and reference numbers. Applicant has reviewed the drawings and identified Figures that include hand-written figures and reference numbers, and superfluous markings. Applicant has amended the Figures by replacing the hand-written figures and reference numbers with appropriate type set figures. Applicant has also renumbered several of the Figures in accordance with the Preliminary Amendment in this matter filed June 22, 2004 at pages 8-9. The changes made to the drawings are:

Figure 2, removed superfluous hand written text "Wafer Stage."

Figure 3, added reference designators 302, 304, and 306.

Figure 8 renumbered to Figure 8A.

Figure 8A renumbered to Figure 8B.

Figure 10 renumbered to Figure 10A.

Figure 10A renumbered to Figure 10B.

Figure 12 renumbered to Figure 12A.

Figure 12A renumbered to Figure 12B.

Figure 14 renumbered to Figure 14A.

Figure 14A renumbered to Figure 14B.

Figure 20 renumbered to Figure 20A and reference designators 2001 and 2002 added.

Figure 20A renumbered to Figure 20B and reference designator 2010 added.

Figure 21 renumbered to Figure 21A.

Figure 21B titled amended to renumber Figure 21 to Figure 21A.

Figure 32 reference designator 3202 added.

Figure 33 reference designators 3302 and 3304 added.

Figure 35 reference designator 3502 added.

Figure 36 reference designator 3602 added.

Replacement drawings with "Replacement Sheet" in the top margin are presented in the "Replacement Drawings Sheets" accompanying this request for reconsideration.

Rejection of Claims Under 35 U.S.C. § 103

Claims 44 and 50

In paragraph 3 of the pending Office Action, the Examiner rejected Claims 44 and 50 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent Number 5,805,290 to Ausschnitt et al., ("Ausschnitt") in view of U.S. Patent 6,204,912 to Tsuchiya et al. ("Tsuchiya"). In rejecting Claims 44 and 50, the Examiner asserted that the combination of Ausschnitt and Tsuchiya disclosed all the limitations recited in Claims 44 and 50. The Examiner acknowledged that Ausschnitt "fails to disclose that the second reticle pattern is shifted in a desired direction", but asserted that Tsuchiya teaches this limitation. The Examiner also asserted that "it would have been obvious to an artisan of ordinary skill in the art at the time the invention was made to integrate the teachings of Tsuchiya to the teachings of Ausschnitt in order to position the reticle pattern so that the reticle pattern may be located at a desired location to facilitate the measurement of the overlay and provide a more accurate product."

Applicant respectfully submits that neither Ausschnitt nor Tsuchiya, neither individually nor in combination, disclose all of the limitations of Claims 44 and 50. As

noted by the Examiner, Ausschnitt does not disclose that the second reticle pattern is shifted in a desired direction and Applicant submits that Tsuchiya also fails to disclose this limitation.

The Examiner states that "Tsuchiya teaches that the position of the reticle 102' shifts in a Y direction (col. 14 lines 54-60)." To the contrary, Tsuchiya does not describe exposing attributes that interlock with a previous exposure after the stage has been shifted in a desired direction relative to the reticle. Tsuchiya describes exposure techniques where "a reticle 102 on which a gate electrode pattern is formed is mounted on reticle stage" and exposed onto a substrate. (Tsuchiya col. 14, lines 9-16). Subsequently, "a reticle 102' on which a source drain electrode pattern is mounted on the reticle stage (not shown)." (Tsuchiya col. 14, lines 40-42). Thus, Tsuchiya describes using two different reticles to produce two exposures. In addition, Tsuchiya does describe that "the reticle stage of the scanning-type projection exposure apparatus 100', which supports the reticle 102' is moved so that the position of the reticle 102' shifts in the Y direction by the predetermined distance from the position of the reticle 102 that was mounted on the scanning-type projection exposure apparatus 100." (Tsuchiya col. 14, lines 54-60). But, Tsuchiya goes on to describe that "at the same time, the X-Y stage that supports the glass substrate 104 is also moved in the Y direction by the predetermined distance." (Tsuchiya col. 14, lines 60-62). Thus, Tsuchiya describes moving the reticle stage and the X-Y stage the same direction and amount so that there is no relative motion between the reticle stage and the X-Y stage.

Thus, unlike Claims 44 and 50 that recite a single reticle, Tsuchiya describes that two different reticles are used, a first reticle 102 used to form a gate electrode pattern, and a second reticle 102' used to form a source/drain pattern. Claims 44 and 50 recite that alignment attributes interlock after the stage has been shifted in a desired direction relative to the reticle. In contrast, Tsuchiya has no relative motion between the reticle stage and the X-Y stage.

Applicant respectfully submits that neither Ausschnitt nor Tsuchiya, either individually or in combination, disclose all of the limitations of Claims 44 and 50. As noted by the Examiner, Ausschnitt does not describe all of the limitations of Claims

45 and 50, and the addition of Tsuchiya does not overcome these deficiencies. Neither Ausschnitt nor Tsuchiya recite that alignment attributes interlock after the stage has been shifted in a desired direction relative to the reticle.

Furthermore, both Ausschnitt and Tsuchiya teach away from shifting between exposures. As stated by Ausschnitt, "bias and overlay error may be calculated for the X and Y directions by measurement of distances between edges within an array, or between arrays on the same or different levels." (See Ausschnitt Col. 10 lines 5-8). Because Ausschnitt calculates bias and overlay error by measuring the distances between edges of arrays, any "shift" of the array pattern would be considered an error and would make Ausschnitt inoperable. Likewise, Tsuchiya describes that "because the reticle 102' and the glass substrate 104 are shifted a predetermined distance relative to the projection lens system 105a'-a05g', the projection areas 107a' and 107e' for the source/drain electrode overlap each other in the Y direction in the area b'." (See Tsuchiya col. 15, lines 12-17 and Figure 14(a)). Thus, Tsuchiya shifts both the reticle and the substrate by the same amount, and any "shift" in their relative positions would make Tsuchiya inoperable.

Applicant respectfully submits that Claims 44 and 50 are patentable over Ausschnitt and Tsuchiya, both individually or in combination. Thus, Claims 44 and 50 are in condition for allowance.

Claims 45 and 47

In paragraph 4 of the pending Office Action, the Examiner rejected Claims 45 and 47 under 35 U.S.C. § 103(a) as being unpatentable over Ausschnitt as modified by Tsuchiya in view of U.S. Patent No. 5,700,602 to Dao ("Dao").

In rejecting Claims 45 and 47, the Examiner asserted that Ausschnitt, as modified by Tsuchiya, discloses all of the limitations of Claim 44 from which Claims 46 and 47 depend, either directly or indirectly. The Examiner acknowledged that Ausschnitt and Tsuchiya failed to disclose a reticle that has reduced transmission, but the Examiner asserted that Dao disclosed this limitation because Dao disclosed an attenuated phase-shift reticle that uses an embedded film which is engineered to have a deduced transmission.

Applicant respectfully submits that neither Ausschnitt, Tsuchiya, nor Dao, either individually or in combination, disclose all of the limitations of Claims 45 and 47. As discussed above, neither Ausschnitt, nor Tsuchiya, either individually or in combination, describe all of the limitations of Claim 44 from which Claims 45 and 47 depend. The addition of Dao does not overcome these deficiencies. None of the references recite that a subsequent exposure is shifted in a desired direction relative to a previous exposure.

Dao describes a "method and apparatus for determining phase difference in a phase-shifted reticle." (Dao Col. 2, lines 62-63). Dao goes on to describe that a matrix of exposures of a reticle are made at different focal distances and different exposure levels. After exposure of each of the fields of the matrix, the wafer is developed and minimum, or critical, dimensions are measured. See Dao Col. 5, lines 2-17. Thus, unlike Claims 45 and 47, Dao does not describe a shift in a desired direction between exposures.

Furthermore, like Ausschnitt and Tsuchiya, any shift within Dao's exposures would be detrimental to Dao's measurement of the critical dimension, as the shift would be attributed to the critical dimension. Thus, Ausschnitt, Tsuchiya, and Dao all teach away from shifting the reticle while forming their exposures and do not render Claims 45 and 47 obvious.

Applicant respectfully submits that Claims 45 and 47 are patentable over Ausschnitt, Tsuchiya, and Dao, both individually or in combination. Thus, Claims 45 and 47 are in condition for allowance.

Claim 46

In paragraph 5 of the pending Office Action the Examiner rejected Claim 46 under 35 U.S.C. § 103(a) as being unpatentable over Ausschnitt as modified by Tsuchiya and Dao and further in view of U.S. Patent 5,262,257 to Fukuda ("Fukuda").

In rejecting Claim 46, the Examiner acknowledged that Ausschnitt, Tsuchiya, and Dao all failed to disclose a reticle comprising a partially reflecting dielectric coating. The Examiner asserted that Fukuda disclosed this limitation because

Fukuda disclosed an alignment pattern of a mask formed by a dielectric material film.

Applicant respectfully submits that neither Ausschnitt, Tsuchiya, Dao, nor Fukuda, either individually or in combination, disclose all of the limitations of Claim 46. As discussed above, neither Ausschnitt, Tsuchiya, nor Dao, either individually or in combination, describe all of the limitations of Claim 45 from which Claim 46 depends. The addition of Fukuda does not overcome these deficiencies. None of the references recite that a subsequent exposure is shifted in a desired direction relative to a previous exposure.

Fukuda describes techniques for manufacturing a "mask having a high efficiency by which the signal-to-noise ratio of the alignment signal light can be improved to assure high-precision and high speed alignment." (Fukuda Col. 3, lines 13-17). Thus, Fukuda does not describe exposing sets of alignment attributes that interlock with previous exposures of different sets of alignment attributes after a subsequent exposure has been shifted in a desired direction relative to a previous exposure, as is described in Claim 46.

Furthermore, like Ausschnitt, Tsuchiya, and Dao, any shift between exposures would be detrimental to Fukuda's high precision alignment. Thus, Fukuda, like Ausschnitt, Tsuchiya, and Dao, teaches away from shifting while forming exposures.

Applicant respectfully submits that Claim 46 is patentable over Fukuda, Ausschnitt, Tsuchiya, and Dao, individually or in combination. Thus, Claim 46 is in condition for allowance.

Claims 51-54

Applicant respectfully submits that new Claims 51-54 are patentable distinct over the cited art. Applicant submits that neither Ausschnitt, Tsuchiya, Dao, nor Fukuda, either individually or in combination, disclose all of the limitations of Claims 51-54. For example, none of the cited references disclose a reticle used for determining inter-field overlay error of a stage on a projection imaging tool, the reticle comprising a pattern including at least two arrays of alignment attributes such that the arrays of alignment attributes have features complementary to each other

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and the arrays are offset from each other in distinct directions, wherein a first reticle pattern is exposed onto a substrate thereby producing a first exposure, and a second reticle pattern is exposed onto the substrate thereby producing a second exposure, wherein the second reticle pattern overlaps the first reticle pattern and is shifted in a desired direction so that at least one row or column of alignment attributes of the first exposure overlays with at least one row or column of complementary attributes of the second exposure, thereby creating an interlocking row or column of completed attributes, measuring positional offsets of the alignment attributes in the interlocking row or column of completed attributes, and determining a stage distortion and yaw error map from the offsets.

Conclusion

Applicant respectfully submits that all the pending claims in the application, Claims 44-47 and 50-54, are in condition for allowance. Reconsideration and further examination of the application are requested. A Notice of Allowance is solicited.

Respectfully submitted,
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